

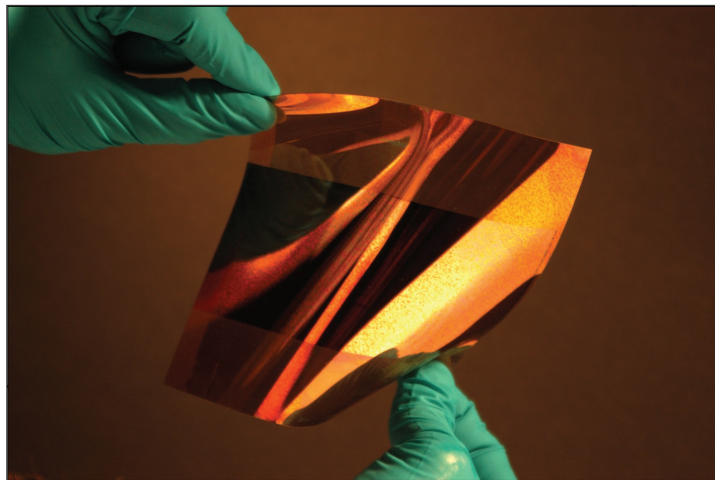


Air Force Research Laboratory|AFRL

Science and Technology for Tomorrow's Air and Space Force

Success Story

ORGANIC SOLAR CELLS INCREASE POTENTIAL FOR FLEXIBLE, LIGHTWEIGHT POWER SOURCE AND HIGH EFFICIENCY SATELLITE ARRAYS



Organic photovoltaic devices are flexible, lightweight, and inexpensive and will support both the Air Force and broad commercial applications. The incorporation of nanotubes during development and testing of the solar cells shows a fivefold improvement in charge transport capabilities. In addition, the introduction of alternative electron-accepting materials yields a threefold improvement in solar cell efficiency.



Air Force Research Laboratory
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Accomplishment

Scientists and engineers at the Materials and Manufacturing Directorate have made significant advancements in developing flexible, organic-based solar cells and photodetectors for use in a variety of Air Force systems. One of the devices developed under contract during the basic research phase of this effort is a flexible, dye-sensitized solar cell with greater than 10% power conversion efficiency.

The directorate's Polymer Branch and the Airbase Technologies Division collaborated to explore a diverse range of near-term applications such as power generation for military tent structures and mobile military units. Potential long-term applications include providing power for satellites and communication systems.

Background

A variety of potential Air Force systems need highly efficient, flexible solar cells to convert solar energy to electrical power. Historically, the development of solar cells and photovoltaic devices was limited to the use of crystalline silicon wafers or thin film deposition of other inorganic materials, a process that typically requires expensive manufacturing technologies.

The Airbase Technologies Division is working on replacing conventional electrical power generators at deployed airbases with a more distributed system of power generation. By incorporating the new solar cell technology in tent structures, researchers expect to lighten the logistical burden of deployment and to facilitate agile combat.

Special operations personnel could benefit from the lightweight, flexible solar cell technology through reduced weight of equipment and supplies carried into the field. By combining solar cell technology with rechargeable batteries, the overall weight of the required supplies and their electrical power systems will decrease.

Solar arrays and photodetectors for space satellites yield longer-term applications provided they overcome the most stringent requirements of the space environment. The directorate, in collaboration with the Space Vehicles Directorate, has initiated preliminary space irradiation and durability testing on organic materials for photovoltaic devices.

Additional information

To receive more information about this or other activities in the Air Force Research Laboratory, contact TECH CONNECT, AFRL/XPTC, (800) 203-6451 and you will be directed to the appropriate laboratory expert. (03-ML-44)

Materials and Manufacturing
Emerging Technologies